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THE FIRST NILE CATARACT.

A Description of the First or Aswan Cataract of the Nile. By Dr. John Ball. Pp. 121; with 13 maps and plates, and 20 illustrations in the text. (Cairo: National Printing Department, 1907.) Price 200 milliemes.

AMONG the numerous valuable memoirs that have issued from the Egyptian Survey Department under the energetic administration of Captain Lyons, none is likely to prove of greater general interest to the public than this work of Dr. Ball. The easy accessibility of Aswan to visitors sojourning at Cairo, the wealth of objects of antiquarian interest in its neighbourhood, and the existence of that great engineering feat—the Nile dam—ensure the result of a constantly increasing stream of tourists to the district; and although the English, German and French guide-books to Egypt, published by Murray, Baedeker and Hachette respectively, have such a well-deserved reputation, yet the complete topographical and geological survey of the district, made by so competent an official as the author, has enabled him to supply many precise data and new observations not hitherto accessible to the writers of these guide-books. Dr. Ball, indeed, comes with excellent qualifications to the task before him; a good geologist, with special knowledge of petrography, he is at the same time skilled in surveying and engineering matters, while the account which he gives of the literature bearing on the district (pp. 15–20) shows that he has not been unmindful of the importance of this branch of knowledge in connection with a country having such a past as Egypt.

At the outset, the author has to correct the popular misconceptions concerning the nature of the Nile "cataracts." He writes:—

"There is nothing about a Nile cataract in any way resembling Niagara, nor even the Falls of the Rhine at Schaffhausen. The total fall of the water-surface at the First Cataract (between Philae and Elephantine) is only about 5 metres in a length of about 9 kilometres; and although the greater part of the fall is concentrated within a fraction of this total length, it is only sufficient to give rise to rapids, and not to a waterfall in the ordinary sense of the term. The obstruction to navigation offered by a Nile cataract is in fact due, not so much to the velocity of the water, as to the irregularity and conflicting nature of the currents caused by the narrowness, winding nature and rocky state of the channels."

Aswan was always a place of great importance. Under its ancient name of "Syene," it is constantly mentioned by the writers of antiquity, including the prophet Ezekiel, and many of the Greek and Roman authors. It formed the limit between Egypt and Ethiopia (Nubia), and observations made on the shadows cast by gnomons erected at Syene and Alexandria respectively were employed by the early geographers in determining the size of the earth and the obliquity of the ecliptic. Although Syene was regarded as situated on the tropic of the Cancer, yet,

as Dr. Ball points out, Aswan is really $37' 57''$ (71 kilometres) north of the tropic; and the period at which, by the secular variation of the obliquity, the site of Aswan coincided with the tropic was about 3500 B.C. Besides the gnomon, there were deep vertical wells sunk at Syrene, the bottoms of which were illuminated by the sun at midday at the summer solstice. These wells are mentioned by many ancient writers, including the geographers Strabo, Pliny, and Ptolemy.

The geological survey of this very interesting district was, of course, facilitated by the numerous excavations made during the construction of the great dam. But, on the other hand, the non-existence of any accurate topographical map of the district presented a difficulty which could only be got over by a complete survey of the whole area round the cataract. The line laid out for the dam by the engineers afforded Dr. Ball an excellent base-line, and from this a network of triangles was measured with a good theodolite, the details being filled in with sufficient accuracy by means of the plane-table. Heights were measured from the mean Nile level by the theodolite. This map, which is in six sheets, is a great improvement on any previous one, and has been issued by the Survey Department, its scale being $1:60,000$, but a reduced copy forms plate i. of the work before us.

The geological formations present in the district as shown by the geological map (plate ii.) are:—

(3) Recent deposits, including those formed by the wind (desert sands) and those deposited by the river (Nile muds and sands).

(2) Nubian sandstones and clays, which cap many of the hills.

(1) Metamorphic and igneous rocks, constituting the foundation of the whole country.

The observations of the author on the chemical composition of the Nile muds and sands, and on the nature and form of the mineral particles present in them, are of great value and interest, and are illustrated by some excellent drawings, reproduced in collotype in plate iii. It appears both from recent analyses made in Cairo, as well as from the earlier work of Hofmann, that the Nile sands contain only small amounts of the hydrated aluminium silicates (kaolin, &c.), but consist mainly of finely comminuted felspars and other minerals, but little altered.

The work of the geological survey seems to have demonstrated that the Nubian sandstones in this district are wholly of Cretaceous age, although in the Sinaitic Peninsula there are Carboniferous sandstones of very similar appearance.

In opposition also to earlier statements made to the contrary, it is shown that the igneous intrusions are confined to the metamorphic rocks and that they are all older than the Nubian sandstone.

Aswan, or Syene, is of interest to petrologists from the circumstance that a large and important class of rocks derives its name from this locality. The name "Syenite" was first applied to the granitic rocks which were so familiar to the ancients from the circumstance that they were the materials of the great Egyptian monoliths (obelisks, statues, &c.). In 1788,

Werner restricted the use of the term by making the hornblende-orthoclase rock of the Planenschen-grund, near Dresden, the type of the class; and now geologists are agreed in retaining the term for rocks with granitic structure but of intermediate composition, containing little or no free quartz, and having orthoclase as their predominant felspar. Rocks of this class do occur at Aswan, as shown by Dr. Ball, but they appear to be in all cases subordinate to the true granites with which they are associated.

The chief rocks quarried at Aswan, both in ancient times and also recently, for the construction of the dam, are these granites, sometimes coarse-grained and porphyritic, at other times fine-grained. Both hornblendic varieties and types of these rocks rich in mica occur, and by the diminution of proportion of the quartz and the increase in abundance of the subordinate plagioclase, the rocks pass locally by insensible gradations into syenites and diorites.

Full descriptions with excellent figures (plates iv. to xi.) are given by Dr. Ball, not only of these plutonic types, but also of the various metamorphic rocks, and of the rocks that form dykes cutting through both metamorphic and plutonic masses. The survey has, of course, given the author abundant opportunities for collecting specimens, of which he has made ample use. Like Prof. Bonney, who examined a series of the Aswan rocks collected by the late Principal Dawson in 1886, Dr. Ball is struck with the general resemblance of the metamorphic and igneous rocks, both of Upper Egypt and the Sinaitic area, to the Archæan rocks of North America, and he suggests that they may not improbably be of the same great antiquity. The crushing and faulting of these rocks with the intrusion of various dykes took place, the author of this memoir argues, at a date long subsequent to their formation, and this action continued quite down to Cretaceous times, when the Nubian sandstone was deposited quite unconformably on their greatly denuded surfaces. Near the cataract of Aswan no remains of the Eocene clays and limestones, found in other parts of Upper Egypt, occur—they have probably been removed by denudation. Subsequently to the Eocene period, there has been elevation and great denudation. At this period of elevation most of the faults which play such an important part, as shown in this memoir, in producing the general features of the cataract area were formed. By the denudation the older metamorphic and igneous rocks were exposed, and the escarpments and outliers of Nubian sandstone formed.

In the concluding pages of this interesting memoir the author adduces evidence to show that the ancient course of the Nile lay in a broad valley east of the present river, and he discusses the problem of the causes which have led to important changes in the course of the river and the effects of these changes on the character of the country. We must wait for the extension of the geological survey of Egypt, to districts which at present remain untouched, for a full solution of these problems. It is interesting to learn that, although the site of the great Nile dam was determined prior to the execution of the geological

survey, Dr. Ball is of opinion that the line actually chosen for it was a satisfactory one, and that the results of the survey do not indicate that any better site could have been selected for it; and, further, that the straight form, finally adopted for the dam, has been at least equally successful in avoiding the difficulties presented by crushed and decayed rocks as would the curved form originally suggested.

J. W. J.

THE "HISTOIRE INTIME" OF NITROUS OXIDE.

Das Lachgas: eine chemisch-kultur-historische Studie.
By Prof. Ernst Cohen. Pp. iv+99. (Leipzig: W. Engelmann, 1907.) Price 3.60 marks.

HABITUÉS of the Royal Institution, and especially those who have interested themselves in its early history, are aware of the existence of a characteristically coarse caricature of Gillray's entitled "Scientific Researches! New Discoveries in Pneumatics! Or an Experimental Lecture on the Powers of Air," which first appeared in 1802, and is stated by Wright and Evans, who published in 1851 a descriptive account of Gillray's cartoons, to represent Dr. Garnett, the first professor of chemistry in the Royal Institution, administering, with the aid of his assistant, Humphry Davy, what is presumably laughing-gas to Sir John C. Hippesley, a noted patron of the Institution and prominent as a manager, with results disquieting to his "internal economy," and disastrous to "That garment 'twere rude to do more than allude to," as Thomas Ingoldsby says.

This print is hardly so rare as Prof. Cohen would seem to imply, and it has already done duty in connection with the early history of the Royal Institution. It—or rather what Prof. Cohen styles the *right* half of it—is reproduced in Thorpe's biographical account of Davy, published some years ago by Messrs. Cassell. Prof. Cohen, apparently on the sole authority of Pictet, who visited London in 1801, and contrary to all contemporary evidence and the testimony of the editors of Gillray's works, inclines to the opinion that the person administering the nitrous oxide is Thomas Young, who is styled professor of chemistry in the Royal Institution, a position he never held. Of course, a caricaturist like Gillray, who allowed himself unlimited licence, and was bound by no rules either of decorum or probability, might, in portraying a wholly imaginary incident, commit any anachronism he pleased. But there was no reason at the moment why Gillray should be guilty of the anachronism of putting Young into a position he never occupied, since Garnett was the actual professor of chemistry when Davy was assistant, and the humour of the incident—such as it is—is in no wise dependent upon what lecturer is behind the table. Pictet was certainly present at a symposium on a certain Saturday evening at the Royal Institution in the early summer of 1801, when, to quote from a letter from Davy to his friend King at Bristol, "there was respiration, nitrous oxide, and unbounded applause. To-morrow, a party of philosophers meet at the Institution to inhale the joy-inspiring gas. It has produced a great sensation